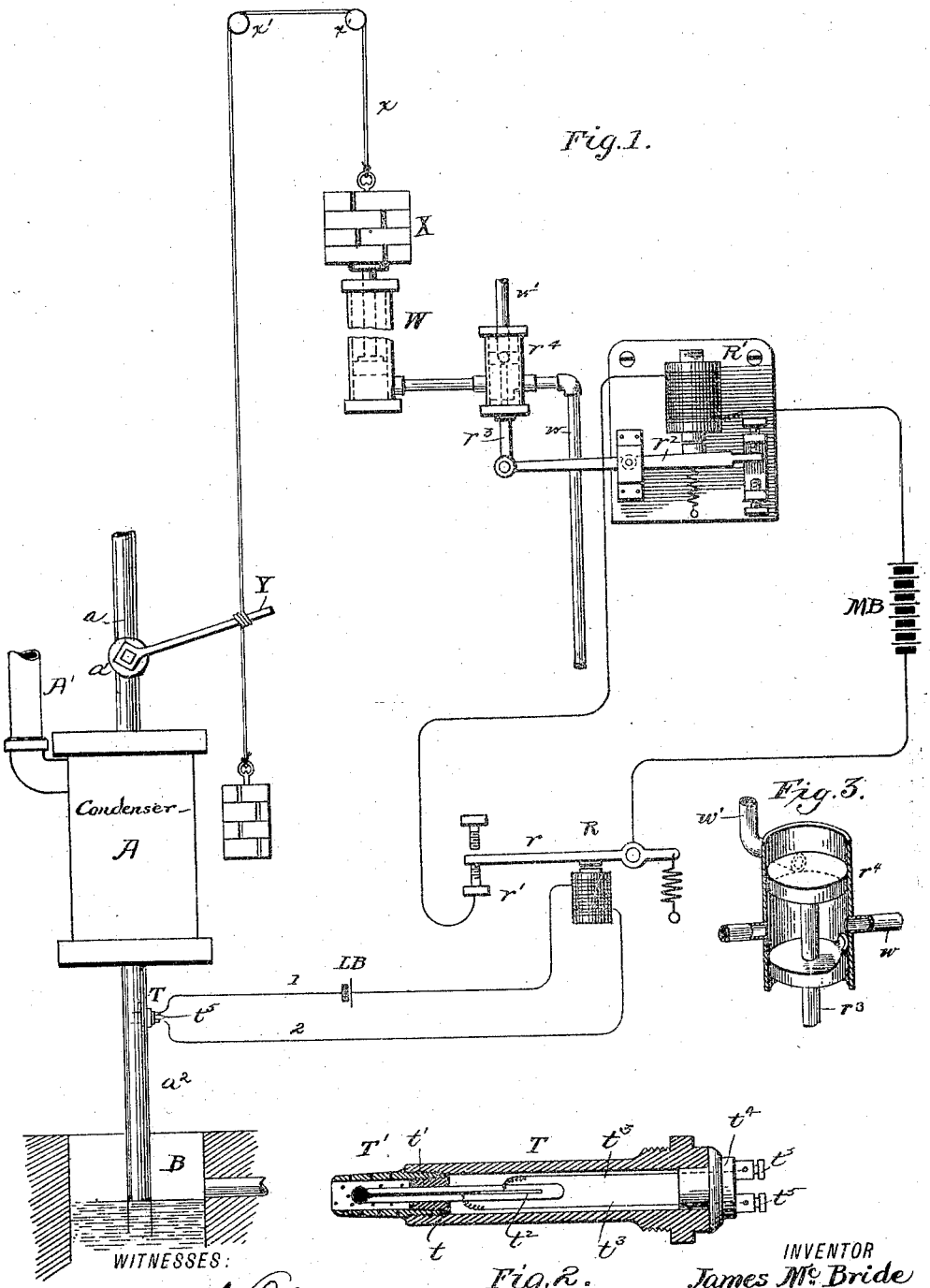
(No Model.)

J. McBRIDE.

ELECTRIC CONDENSER REGULATOR.

No. 456,835. Patented July 28, 1891.



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ELECTRIC CONDENSER-REGULATOR.

SPECIFICATION forming part of Letters Patent No. 456,835, dated July 28, 1891.

Application filed September 24, 1890. Serial No. 365,981. (No model.)

To all whom it may concern:

Be it known that I, JAMES McBRIDE, a citizen of the United States, residing in Brooklyn, in the county of Kings and State of New York, have invented certain new and useful Improvements in Regulators for Vapor-Condensers, of which the following is a specification.

This invention has reference to apparatus for automatically controlling the supply of cold water to condensers in accordance with the quantity or pressure of the vapor which is condensed, the object being to obviate waste of water, to secure a uniform vacuum, and to insure that the quantity of water supplied to the condenser is always proportional to the quantity of heat or the pressure going to the condenser.

The invention consists of a mercurial thermostat placed in the discharge-pipe of a condenser, in combination with an electric circuit and relay, which in turn controls a main circuit, including an electro-magnet, controlling a valve, which admits water to a cylinder containing a piston. The piston is moved by the pressure of water in one direction and by a weight in the opposite direction, which movement is transmitted to the cold-water-injection valve of the condenser.

I will now describe my invention in detail with reference to the accompanying drawings, in which—

Figure 1 represents diagrammatically the apparatus comprehending my improved invention. Fig. 2 represents a detail of the thermostat. Fig. 3 represents a detail of the three-way cock.

A represents a condenser, and *a* a pipe supplying cold water thereto for the purpose of condensation. This pipe usually contains a valve controlled by a hand; but in this invention I have represented simply a valve *a'*, which may be understood as the injection-valve or a simple cut-off valve.

a^2 represents the outlet-pipe from the condenser carrying the waters of condensation and all the liquid contents of the condenser to the hot well B.

A' represents the passage through which the exhaust-vapors pass to the condenser.

In the pipe a^2 I insert at right angles thereto a mercurial thermostat consisting of a metallic tube T, having an internal thread at its inner end, which receives the threaded portion of a short tubular perforated section t', extending beyond the end of the tube T'. The inner end of this short section is fitted with a cork or plug t, which carries a thermometer t^2, the bulb of which is exposed inside of the perforated portion of the tube T'. The thermometer extends back into the tube T, and is fitted with two contact-points projecting into the mercury column, one of the conductors being located at a point where it is desired to close the electric circuit and the other at some point below this. Conducting-wires t^3 t^3 lead through a block t^4 in the end of the tube T to binding-posts t^5 t^5, located on the outside of pipe a^2. From these binding-posts wires 1 2 are run, which form a circuit, including battery L B and relay R. The armature r and front stop r' of this relay are in circuit with a main battery M B, which also includes an electro-magnet R', acting upon an armature-lever r^2, one end of which is connected with a valve-stem r^3, operating a valve in chamber r^4. This valve controls three ports, one admitting water under pressure from pipe w, another connected with waste-pipe w', and the third leading to a cylinder W. The valve is constructed to either establish communication between the pipe w and the cylinder W, the waste-port being closed or else between the cylinder W and the waste-port w', the pipe w being cut off. The cylinder W contains a piston, which is adapted to reciprocate therein. Connected to the piston-rod is a weight X, to which is attached the end of a cord x, passing over guide-pulleys x' to the end of a lever Y, attached to the stem of the valve a'.

y is a weight attached to the lever Y to move the same in one direction.

Now in operation, when the cold water injected into the condenser has to condense a large quantity of vapor, the water flowing from the condenser becomes quite hot, its temperature being determined by the amount of steam passing to the condenser. When, therefore, the temperature of the water in pipe a^2 becomes abnormally high, it indicates that the supply of cold water is not sufficient to condense all the vapor and that more should be supplied. When this takes

place—that is, when the water flowing through pipe a^2 into the hot well D becomes too hot—the mercury in the thermometer D′ expands and makes metallic connection between the two contacts or terminals of the conductors f^2 f^2 and closes the circuit through relay R, the armature-lever of which closes the second circuit through battery M B and magnet R′, and the latter pulls up its armature and throws the valve in chamber r^4 into such a position that communication will be established between cylinder W and pipe w. The pressure of water in cylinder W will then force the piston and the weight X upward, allowing weight y to pull lever Y down and open to a greater extent the valve a' supplying the cold water. When the supply of water is too great for the work of condensing the steam in the condenser, the lowering of the temperature in the pipe a^2 causes the thermometer to break the circuit and de-energize relay R, thus breaking the circuit, including magnet R′, and allowing the spring connected with the armature a^2 to move the valve in the opposite direction, thus establishing communication between cylinder W and waste-pipe w' and cutting off the supply from w. The weight X then acts to force the piston down and lift the lever Y to close the valve a'.

It has been found in practice that the temperature of the hot well does not vary quite 2° Fahrenheit, and that the device completely takes care of the varying amounts of heat passing to the condenser, and that when the steam is entirely shut off the water is also shut off. This is accomplished by reason of making the stroke of the motor or the piston in the cylinder W quite long and its movement quite slow, so that the piston never reaches the end of its stroke in either direction before a change of temperature reverses its motion. If the steam is entirely shut off, the piston reaches the end of its stroke in one direction, almost closing the valve a', but not quite, so that enough water will remain flowing to start condensation when steam is again put on.

My invention is not confined to a steam-engine, but is obviously applicable to any machinery or apparatus where a condenser is used. For instance, it is well adapted for use in the manufacture of sugar, dye-wood, extracts, and substances whereof light liquors are concentrated in vacuum-pans.

Having thus described my invention, I claim—

1. The combination, with an outlet or waste pipe of the condenser, of a thermostat located therein, electro-magnetic apparatus controlled thereby, a motor controlled by said electro-magnetic apparatus, and a valve located in the cold-water supply of the condenser controlled by said motor, substantially as described.

2. The combination, with the escape or waste pipe of a condenser, of a thermostat located therein, electro-magnetic apparatus controlled by said thermostat, a three-way valve controlling a fluid under pressure and itself controlled by said electro-magnetic apparatus, a motor actuated by said fluid under pressure, and a valve in the cold-water-supply pipe of the condenser controlled by said motor.

3. A thermostat for the purpose described, consisting of a thermometer located in a tubular chamber with its bulb exposed in one end of said chamber, that end being perforated, substantially as described.

In witness whereof I have hereunto signed my name in the presence of two subscribing witnesses.

JAMES McBRIDE.

Witnesses:
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